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A PROBATIONARY ESSAY,

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A  
PROBATIONARY ESSAY  
ON THE  
ACCIDENTS AND DISEASES  
WHICH REQUIRE THE OPERATION OF  
PARACENTESIS THORACIS;  
SUBMITTED,  
BY AUTHORITY OF THE PRESIDENT AND HIS COUNCIL,  
TO THE EXAMINATION OF THE  
**Royal College of Surgeons of Edinburgh,**  
WHEN CANDIDATE FOR ADMISSION INTO THEIR BODY, IN  
CONFORMITY TO THEIR REGULATIONS RESPECTING THE  
ADMISSION OF ORDINARY FELLOWS,  
BY  
JOHN SCOTT, M.D.

OCTOBER 1827.

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MDCCCXXVII.



TO  
HENRY MARSHALL, ESQ.

SURGEON TO THE FORCES,

THIS ESSAY

IS INSCRIBED, AS A MARK OF GRATITUDE AND ESTEEM,

BY HIS FRIEND,

THE AUTHOR.





ON

## PARACENTESIS THORACIS.

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THE accidents and diseases which require the operation of Paracentesis Thoracis, are, effusion of blood into the cavity of the thorax, empyema, and in some rare cases, pneumothorax. It has also been recommended, and by some performed, in phthisis, and hydrothorax.

In the following Essay, my attention will be chiefly directed to the circumstances which render this operation necessary, and to a consideration of the signs by which the effusion of fluid or air into the cavity of the thorax is ascertained.

*Effusion of Blood.*—A wound penetrating the cavity of the chest, may injure one of the intercostal arteries, the lungs, the great vessels, or the heart itself. The latter accidents prove, in general, suddenly fatal: and it is only effu-

sion, in consequence of a wound of the lungs, or intercostal artery, that is likely to render the operation of paracentesis necessary. When the wound is large and direct, the blood makes its way outwardly; the surgeon has sufficient warning of what has happened, and takes his measures accordingly: but when the wound is small, indirect, or situated in the upper part of the chest, the blood effused will, in all probability, accumulate in the cavity of the thorax. The difficulty of ascertaining the existence of this circumstance, has been particularly dwelt upon by authors on surgery. In extreme cases, and where a great quantity of blood has been suddenly effused, the symptoms will afford sufficient evidence of what has happened. Sabatier, in his admirable *Medicine Opératoire*,\* has given the following detail of the symptoms in a case of this nature:—"The patient feels great oppression, and such uneasiness as will not let him long continue in one position. He feels great difficulty in sitting up, unless his body be much bent forwards, in which posture the diaphragm is relaxed, and not so much pressed upon by the extravasated fluid. When the thighs are

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\* Tome ii. p. 93. Edition par Sanson, 1824.



bent, the patient can lie with tolerable ease on his back, or on the side in which the wound is situated ; but he cannot turn himself to the opposite side without feeling very acute pain in the situation of the mediastinum. The respiration is short, and frequent ; the countenance becomes pale, the pulse weak, and the extremities cold : if the lungs are wounded, he expectorates frothy blood, and air issues from the wound.” A considerable effusion of blood, however, may take place into the chest, while most of the above mentioned symptoms are absent. Sabatier acknowledges having seen cases of this kind, and the annals of surgery furnish us with numerous others, where the respiration continued tolerably free, and where the patient did not complain of more pain in one position than in another. The expectoration of frothy blood, after a wound penetrating the chest, is certainly a proof that the lungs are wounded ; but it is by no means a constant attendant on such a wound. The appearance of an ecchymosis of a clear purple colour at the angle of the ribs, extending downwards to the loins, has been generally considered as a certain sign of effusion of blood ; and Sabatier relates a case,

where the patient died from extravasation into the thorax, because, from the absence of this symptom, the surgeon did not consider himself warranted in performing paracentesis. Ecchymosis is, therefore, not constant, nor is it to be depended upon as an indication of the existence or non-existence of effusion. The formidable train of symptoms enumerated by Sabatier, may also present themselves where no blood has been effused. They may arise from empyema, and do not point out the precise nature of the result of the injury.

Blood, when effused into the chest, will, in many cases, be absorbed ; but it sometimes acts as an extraneous body, producing extensive inflammation in the pleura pulmonalis and costalis. Most writers on surgery recommend its removal by an operation ; but they express themselves doubtingly on the subject, owing to the extreme difficulty of ascertaining the existence of effusion into the thoracic cavity.

Monsieur Leveillé informs us, that Scarpa and Volpi found one side of the thorax filled with blood, in a person who died eight days after a wound of the chest, and in whom no symptom led to a suspicion of blood in that cavity. “ No



doubt," says Mr Samuel Cooper, in his Surgical Dictionary, "the true reason for the operation being so seldom performed, is the obscurity of the diagnosis, the symptoms being all of an equivocal nature." Cases of the following description not unfrequently occur:—A small wound is inflicted in the upper part of the chest by a knife or bayonet. Some blood flows from the wound, the patient sinks down pale and oppressed, the pulse is weak and fluttering; he soon, however, recovers, but continues to complain of some oppression in breathing. In twenty-four or thirty-six hours, rigors come on, pain in the side increased on inspiration, and other signs of pleuritic affection make their appearance. The patient is repeatedly and copiously bled each time with temporary relief, but the disease is not subdued, and the same symptoms again return. At times he will appear extremely low, and oppressed with quick difficult breathing, and small rapid pulse. At last he dies, and on examination blood is found accumulated in the cavity, the lung compressed, and the pleuræ covered with a false membrane, or exhibiting other marks of extensive inflammation.

Laennec's brilliant discovery of the advantage of mediate auscultation in detecting diseased changes in the lungs, affords us an easy and certain means of ascertaining the existence of effusion. In cases, such as the one I have alluded to, p. 11. the stethoscope will at once point out the nature and seat of the affection ; it will shew us that there is a foreign body keeping up irritation, and lead to its removal. The lung will be compressed in a degree proportionate to the quantity of the effused fluid, and the situation and extent of the effusion will be correctly indicated by the instrument, as the respiratory murmur will not be heard over a space corresponding to that occupied by the blood.

It must be allowed, that this circumstance does not exactly prove that blood is effused ; for hepatization of the lung, the presence of purulent matter, or air compressing the lung, will present the same phenomenon ; but when taken in connexion with the history of the case, and the signs afforded by percussion, it will enable us to decide with more certainty than by any other means. The distinguishing marks of pneumonia will have preceded hepatization,



and the pleuritic effusion will be pointed out by its appropriate signs. Pneuma-thorax may be more readily mistaken for effusion of blood, as it takes place immediately after a wound, and is accompanied by nearly similar symptoms, and a similar absence of the respiratory sound. In pneuma-thorax, however, the sound on percussion is more sonorous on the injured, than on the healthy side: it is in fact the sound of the empty barrel when struck, while blood gives the dull dead sound.

It is of importance to make our examination both in the erect and horizontal posture. If the respiratory murmur be heard naturally over all the superior part of the chest, we may infer, that the quantity of blood effused is not very considerable; but if it be altogether wanting there, and heard only for a narrow space along the spine, the greater part of the cavity is filled with blood. Our practice will be guided in a great measure by our knowledge of this circumstance: If there be no urgent symptom present, and we know that the effusion is not great in quantity, we may in general trust to the power of absorption for its removal. On the contrary, when the quantity is very great, the



operation ought to be performed without delay. With regard to the different methods which have been proposed for withdrawing blood from the chest, two only merit particular consideration. One consists in enlarging the original wound, the other in performing the operation of paracentesis at some other part of the chest. Either may be had recourse to according to circumstances. When the situation of the wound is favourable to the escape of the blood, the orifice ought to be dilated, and the patient placed in a position to favour the discharge of the fluid : but if, as more frequently happens, the wound is indirect, or situated at the superior part of the thorax, a counter opening ought to be made in the usual place and manner. I have already stated, that the operation is not required in all cases where fluid is effused into the chest ; for it is well known, that a considerable quantity of blood may be removed by absorption. Absolute rest, and the strictest attention to the antiphlogistic regimen, must be imperatively enjoined.

*Empyema*, or the effusion of purulent matter into the cavity of the thorax, can hardly in

itself be considered as a primary disease. It is a termination of another disease ; but one of so much consequence as to merit attentive consideration. Inflammation of the pleura is in general accompanied by an effusion of a greater or less quantity of coagulable lymph and serum into the cavity. If the disease be severe, the effusion is at times very considerable, occasionally so great in quantity as to fill almost the whole cavity. When pleurisy terminates favourably, the serum is removed by absorption, and the lymph is converted into cellular membrane, which forms a bond of union between the pleura pulmonalis and costalis. In some cases this favourable change does not take place ; acute pleurisy occasionally becomes chronic ; the effused fluid is not absorbed, but remains compressing the lung. In chronic pleurisy—which is characterized by the absence of the severe pain, the intense fever, and the violent reaction of the acute disease—the effusion is rarely removed by the efforts of nature. This form of the disease is most commonly met with in patients of an unhealthy habit of body, and particularly where tubercular disease exists in the lungs. In forming our diagnosis in this disease, as indeed in every other, it is of much



consequence to investigate carefully the previous history of the patient's case. After the subsidence of the symptoms of acute inflammation in the chest, if the patient continues, after irregular shiverings, to be affected with a slow fever, with nocturnal exacerbations, we may be led to suspect that effusion in considerable quantity has taken place. The symptoms of empyema are, difficult and frequent respiration, increased on the least motion ; oppression, and a sense of suffocation ; inability of lying down except in particular positions ; harassing cough, generally dry, sometimes attended with expectoration ; hectic fever, with heat in the hands and feet, flushing of the cheeks, and emaciation. These are all general symptoms, however, and accompany other diseases of the thoracic viscera. Empyema occasionally exists where very little constitutional disturbance is present. In one remarkable case I had an opportunity of examining some months since, the disease had been nearly of three years' standing. The left side measured three inches more than the right : The apex of the heart pulsated under the right mamma : The sound, on percussion over the left side, was dull, and the respiratory murmur was heard along the

spine, but no where else—All these signs indicating that the left lung was compressed, and the thoracic cavity full of fluid: yet there was very little constitutional affection. He had slight febrile symptoms, some discoloration of the face, little emaciation; the principal complaint was weakness, and hurried respiration on making any unusual exertion. The more distinctive marks of empyema are,—increase in the size of the affected side, proved by measurement, and very perceptible to the eye; immobility of the ribs in respiration, sometimes over the whole side, occasionally affecting only a part. The intercostal spaces are widened, and, instead of being depressed, they project beyond the level of the ribs: on making pressure upon them, they feel distended, they yield to the fingers, but rebound again immediately.

The skin over the affected side is frequently œdematous. If the effusion be on the left side, the apex of the heart may frequently be felt pulsating on the right side of the sternum. When, along with these signs, we discover by the stethoscope a total want of respiration over a greater or less part of the side, together with the dull sound on percussion, we may consider the



nature of the affection as satisfactorily ascertained. The Hippocratic mode of examination by succussion, succeeds only where air is contained in the same cavity with the fluid. Under the circumstances mentioned, I consider the operation as generally advisable. Our prognosis must always, however, be guarded. The operation has frequently been followed by an unfavourable result, probably, in many instances, owing to its being too long delayed. Should the stethoscope furnish no signs indicative of tubercular excavation in the lungs; should the respiratory murmur be heard in the superior part of the chest, and for a considerable space along the spine, we may venture to entertain a hope that the operation will be beneficial. In most cases, however, the lung is pushed towards the mediastinum and vertebral column, and bound down by a pseudomembrane, with which it is covered. Its texture is condensed, and it does not crepitate. Under such circumstances we cannot hope to render the functions of the injured lung perfect. The operation is, however, a trifling one; and, by evacuating the fluid, we remove the urgent symptoms occasioned by the



weight and pressure thereby exerted on the opposite side, and the derangement its presence kept up in the circulatory system. In young subjects it is generally successful when not performed at too late a period of the disease. In cases of empyema, Laennec advises the opening to be made between the fourth and fifth ribs, on account of the adhesions which are so frequently met with in the superior and inferior parts of the thorax : In this country it is more usually performed between the seventh and eighth, or eighth and ninth ribs.

Before concluding the consideration of Empyema, it is necessary to mention a modification of this disease, where the operation has not been usually resorted to, but in which it will probably be attended with more successful results than in other cases of this nature. I allude to acute pleurisy, where the effusion has been so abundant from the commencement as to threaten suffocation. This has been called Acute Empyema by Laennec. Cases of this kind are sometimes rapidly fatal; and I have witnessed several in which an accurate diagnosis might have led to an early operation for withdrawing the fluid, and by that means

saved the patient's life. In one remarkable case, more than four gallons of fluid were found in the chest, the lung being compressed, but still crepitant and unaltered in texture.

*Pneuma-Thorax.* The operation of paracentesis is occasionally, though not frequently, necessary in this affection. We shall first consider it arising in consequence of external injury. In penetrating wounds, where the opening is free, the operation can never be necessary: it is only in small punctured wounds, and in cases of fractured ribs, with injury to the texture of the lungs, that it can be required. In such cases the air escapes from the ruptured air-cells. If it do not make its escape externally, or pass into the cellular texture, it gradually accumulates in the cavity of the thorax, compresses the injured lung, and produces great anxiety, from the pressure it exerts on the healthy side.

At first there is a sensation of tightness in the chest, which increases to an insupportable feeling of agony. The patient cannot breathe except in the sitting posture, with the body bent forwards; the face becomes red and tumid,



the pulse weak and irregular. If the patient be not relieved, he expires in a state of suffocation. For the purpose of ascertaining the effusion of air into the cavity of the chest, percussion and auscultation will prove of the greatest utility.

The respiratory murmur is wanting over a space indicating the extent to which the injured lung is collapsed, while it is heard along the vertebral column. The chest is more sonorous on percussion than in the healthy state. A crepitant tumor appears generally over the injured part, and eventually extends more or less over the body. In the treatment of this accident, it will be necessary to make scarifications over the external tumor, to allow the escape of the air. Where it appears in consequence of a fractured rib, a broad bandage round the chest will be found extremely useful. It keeps, says Mr Abernethy, the fractured rib from motion, and prevents the air from escaping from the injured lung. The air effused into the thorax will generally be removed by absorption; but if the symptoms become so urgent as to threaten suffocation, and other means of relief fail, a direct opening may be

made into the thorax, as recommended by Hewson and Bromfield. According to Hewson, the opening should be made on the fore part of the thorax, between the fifth and sixth ribs on the right side, and between the seventh and eighth on the left. This operation will, however, be very rarely necessary.

The term Pneuma-thorax is more usually given to air extravasated into the cavity of the thorax independently of external injury. This may take place under different circumstances. The most common variety of the disease is that in which the air proceeds from a communication between the bronchi and sac of the pleura, in consequence of a suppurated tubercle opening into both. I have also seen it follow the rupture of an abscess, which had previously communicated with the bronchial tubes into the pleura. The abscess was the result of a chronic inflammatory change in the lungs, not of a tuberculous nature; and the diagnosis in such cases is very easy. In a patient labouring under the symptoms of phthisis or pneumonic abscess, one side of the chest suddenly becomes more sonorous on percussion than the opposite; the respiratory mur-



mur is either not heard at all, or is only heard along the spine; and if the communication still exists between the bronchial tubes and the air in the thorax, there is conveyed through the stethoscope a peculiar sound, denominated metallic tinkling (*tintement métallique*), from its resemblance to the sound produced by striking gently on a cup of glass or metal. In such a case the operation has been performed, and it is said with great relief to the patient.\* I can hardly imagine a case in which we can promise ourselves much advantage from it. It is possible that, when an abscess in the lungs opens into the pleura, or where, in the early stage of phthisis, a tuberculous abscess discharges itself into the thorax, and where great oppression is suddenly produced, that an opening made into the thorax may prolong life, and procure relief to the patient. Pneuma-thorax not unfrequently complicates empyema. The air appears in some cases to arise from a decomposition of the fluid previously effused. When the chest contains both air and fluid, the

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\* Davy, Philosophical Transactions, 1823.



Hippocratic mode of succussion affords us the splashing sound of water agitated in a half-empty barrel. In such cases the operation is had recourse to for the empyema, not for the pneuma-thorax.